

REMARKS

The Office action of May 21, 2009, has been carefully considered.

Claims 19-31 have been rejected under 35 USC 103(a) over Collins in view of Noll and Yvin et al.

Collins is directed to a machine and method for kneading dough, the process to be carried out in the presence of air or an oxygen-containing gas, particularly a mixture of oxygen and air. The Office action recognizes that Collins does not teach the use of ozone, or that ozone may be partially dissolved in the wetting water. The Office action alleges, however, that Noll teaches a method of mixing flour and water to make bread dough with oxygenating agents which may include ozone (paragraph [0014]), and using a mechanical agitator (paragraph [0028]). Further, Noll is alleged to teach that the wetting water may be impregnated with added oxygen to promote oxidation (paragraph [0014]).

The Office action admits that Collins and Noll do not teach the ratio by which ozone may be added to the bread dough, but that Yvin et al teach a method of ozonating grain flour where ozone may be supplied by direct gas or dissolved in wetting water in a range of 0.5-20 g/kg of grains.

Applicants note initially that the Yvin et al reference is from a non-analogous art. While the invention, Collins and Noll all relate to converting flour to dough, Yvin et al relates to converting wheat grains to flour, an entirely different process. Yvin et al discloses the use of ozone to treat whole grains of wheat, before or simultaneously with grinding the wheat grains to produce flour. Wheat grains have a diameter of 1 mm or more, and a whole series of cell layers are intact. By contrast, flour consists of ground wheat grains with a typical particle size about 50 μm , as explained in the introduction to the present specification.

Harvested wheat grains possess a cuticle as well as a

number of external protective layers. Contamination is typically present, and this may be of natural origin, or artificial origin, such as pesticide contamination.

Yvin et al teaches the use of ozone in the grinding process to reduce the contamination.

According to the invention, the starting material, wheat flour, is entirely different from that of Yvin et al, and the reason for adding the ozone is entirely different from that of Yvin et al. Accordingly, the Yvin et al reference does not teach one of ordinary skill in the art to utilize ozone in the process of kneading dough, or suggest the amount of ozone which should be used in kneading dough; there is no reason to utilize the teachings of Yvin et al in combination with Collins and Noll, which both relate to the process of kneading dough.

The Collins reference relates to a process for kneading dough in which ascorbic acid is present as an improver. In fact, in the first paragraph of the specification, Collins states that it is related to a method for maximizing the utilization of ascorbic acid as a bread improver. In order to do so, Collins teaches using an excess of pressure in the atmosphere around the dough during a first phase, and a reduced pressure during a second phase, specifically designed to improve the use of ascorbic acid, as disclosed at page 4, line 29 to page 5, line 9. In fact, ascorbic acid is not in itself a dough improver, but must be oxidized to dehydroascorbic acid in order to become a dough improver; Collins refers to dehydroascorbic acid as "the true oxidising improver" on page 3 of the reference. Dehydroascorbic acid modifies the gluten protein component of wheat flour and contributes to network building in developing dough. This is a much different mechanism from the improvement provided by ozone, a powerful oxidant which, *inter alia*, transforms a part of the starch in the flour to maltose, which contributes to

fermentation reactions that take place during the kneading in the presence of yeast. The effects of ozone go well beyond those of dehydroascorbic acid, and the handling of ozone naturally requires different conditions of temperature and pressure.

The Noll reference, on the other hand, relates to a method for kneading dough in which mechanical elements are not necessary, being replaced by liquid under high pressure. According to the Noll disclosure, this method greatly reduces the kneading time, and the reduced kneading time results in dough which has not yet sufficiently developed with regard to oxidation. In order to improve the oxidation level with the short kneading time, Noll teaches adding oxidizing agents, such as ascorbic acid, ozone and hydrogen peroxide, and possibly impregnating the water under high pressure with oxygen.

Separately, Noll teaches that mechanical kneading elements may also be used, but these are not required as the point of the patent application is that the use of high pressure water for kneading can replace kneading with mechanical elements. Thus, the addition of oxygen to the kneading water in the Noll application solves a problem which is specific to the Noll application, that the dough does not have sufficient time to oxidize with the very short kneading times. There is no reason why one would make a corresponding change to the Collins process, since Collins uses conventional mechanical mixing, providing adequate time for oxidation of the ascorbic to dehydroascorbic acid. Moreover, Collins discloses a specific method of increasing and decreasing pressure in order to incorporate sufficient quantities of oxygen for the purpose, so one of ordinary skill in the art has no reason to utilize the teachings of Noll for an entirely different purpose.

However, even assuming *arguendo* that the references set

out a *prima facie* case for obviousness of the invention, Applicants have submitted sufficient evidence of the advantages of the invention to overcome such obviousness.

Generally, a number of oxidizing improvers are known for use in the art of bread making, and are well summarized in the Collins reference. Apart from doubts over toxicity, which have to a certain extent driven research in the field, Applicants have observed that certain known oxidants such as bromate do not necessarily enable a saving in time, because the visco-elastic state of the dough generated by oxidation and bubble production can complicate mechanical stirring.

Each type of oxidizing system is associated with particular problems in terms of the production of bubbles, modification of proteins, and structure of the dough, and it is not possible to predict in advance the actual effects of any particular oxidizer during kneading. Thus, one cannot predict what the effects might be of transferring the teachings of Noll to the process of Collins.

For this reason, Applicants consider it unreasonable to characterize the Noll reference as anything other than a very speculative suggestion to use ozone. Applicants have extensive experience in handling ozone in an industrial environment, and good reason to believe that ozone could not have been used in the kneading conditions that characterize the Noll reference.

Applicants have observed that the use of ozone enables improvement of time of kneading for a given speed of rotation of the frasers during kneading, as well as an improvement in the energy required, in comparison to the use of oxygen. Applicants have also observed that ozone produces fermentation by enzyme fractions in the dough, and the time necessary for the dough to rise after kneading is often reduced. Although the time needed for the dough to rise varies considerably according to conditions, understanding situations in bakery

practice with a rest phase of 80 to 120 minutes in an atmosphere of constant humidity, a time gain of approximately 15 minutes can be obtained with respect to the rise of the dough.

Experimental evidence regarding the improvements obtained by use of ozone is set forth in the present specification in paragraph [0104] to [0123] of the published application.

Paragraphs [0104] through [0108] discuss the reduction of energy costs which are obtained. Thus, for a kneading speed of 40 rpm, kneading time is reduced from 3-4 minutes to 2-3 minutes according to the invention. For a kneading speed in the range of 80 rpm, the kneading time is reduced from 10-12 minutes to 7-9 minutes. Thus, the improvement in kneading time is generally more than about 2 minutes.

Paragraphs [0109]-[0118] discuss a rheo-fermentometer study. The results of this testing are set forth in Figure 5, in which the curves relate to production with and without ozone. A comparison shows that dough treated with ozone releases more carbon dioxide than the non-treated dough, which clearly demonstrate a better oxidation process inducing greater fermentation.

Paragraphs [0119]-[0123] relate to a study using a consistograph, a tool for measuring dough consistency and dough formation time. Results are set forth in Figure 6, showing that the pressure of the sample treated with ozone during its kneading rises faster than that of the non-treated sample and for an almost identical maximum pressure, the pressure of the sample decreases more slowly than the pressure of the non-treated sample. Thus, kneading in an ozone atmosphere imparts to the dough obtained a marked propensity for better subsequent machinability and greater tolerance.

Thus, the present application shows improvements in the dough obtained in treatment with ozone, as compared to dough obtained in treatment without ozone. Such improvements could

not be predicted from the state of the art, and in fact it is very difficult to predict how a specific oxidizing treatment might affect the dough in a general sense.

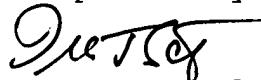
In addition to consideration of the above, Applicants note that a new Claim 37 has been added to the application, reciting that oxidation of protein fractions occurs during the kneading, as set forth in paragraph [0012] et seq of the published application, and that the oxidation occurs as a result of the presence of oxidizers consisting of oxygen and said ozone. The presence of oxygen should be clear from the discussion in paragraph [0056] of the published application relating to the production of ozone, and the presence of only oxygen and ozone as oxidizers should be clear from the example of the present specification, in which no further oxidizers are used. Claim 37 clearly excludes the ascorbic acid as set forth in the Collins reference.

Withdrawal of this rejection is requested.

Non-elected and withdrawn claims 32-36 have been canceled.

In view of the foregoing amendments and remarks, Applicants submit that the present application is now in condition for allowance. An early allowance of the application is earnestly solicited.

Respectfully submitted,



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